DETAILED ACTION

Response to Amendment

The amendment filed 10/23/2009 has been received and considered for examination. Claims 1-27 remain pending.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1-3 and new claims 20-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsukahara et al. (US 6566787).

With regard to claim 1, Tsukahara et al. teach a sensor head, comprising:

a three-dimensional base body (Figure 1, (10)) having a curved surface allowing definition of a circular orbital band (12b);

an interdigital ((14c) comb like Col. 3 lines20-49) electroacoustic transducer (14) arranged on the orbital band of the three-dimensional base body, configured to excite surface acoustic wave to perform multiple roundtrips along the orbital band; and

a sensitive film (14a) capable of being gas permeable (Col. 10 lines 54-57) at least a part of which is formed on at least a part of the orbital band of the three-dimensional base body, and capable of changing its surface acoustic wave characteristic in order to react with a specific gas molecule (Figures 1 and Col. 10 lines 54-57 teaching of a biosensor).

Wherein the interdigital transducer (14c) is capable of converting the surface acoustic wave orbiting along the orbital band into a high frequency electric signal further capable of

detecting the change in the propagation characteristic (i.e., see claim 2 and Col. 11 lines 23-28's teaching).

With regard to claim 2, Tsukahara teach the orbital band is defined on the surface of the outer periphery of the three-dimensional base body (Figure 1).

With regard to claim 3, Tsukahara teach the orbital band is defined on the interior face of a cavity of the three-dimensional base body (Figure 6, barreled cavity 61 with inner surface including 12c).

With regard to claims 20 and 21, which contain intended use terms, the Examiner will interpret these claims in light of the structural elements that are disclosed and not for their intended use as stated after the terms "used to" "converted by" "measured by". These terms and phrases are intended use terms. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Exparte Masham, 2* USPQ2d 1647 (1987). The Examiner has applied references, which are capable of meeting these functions. A structure, which is capable of providing the intended use, is considered to meet the limitation of intended use recited in a claim to a device or an apparatus. Therefore, the structural recitations of an interdigital transducer (14) and a capability of being used as a gas sensor when a gas is flown into cavity (61) (Col. 10, lines 54-58).

With regard to claim 22, Tsukahara teach their substrate (60) to be made of piezoelectric crystal material (Col. 11 lines 9-13).

With regard to claims 23 and 24, the electrostatic transducer is provided in an opening and is separate from a film (14a) in that it is provided on top of the film (Figure 1) and it is capable of being sensitive to gas (Claim 2, Col. 10, lines 54-58).

With regard to claims 25 and 26, the transducer is provided on the film (Col. 5 lines 20-25 for example) and the gas sensitive film is capable of being made from piezoelectric film (Col. 5 line 26).

With regard to claim 27, Tsukahara teach a sensor head comprising the recited attributes in the description regarding claim 1 above. Furthermore, the newly recited limitation of a second interdigital transducer (i.e., oscillator (14b)) arranged on the orbital band of the three-dimensional base body separated from the first electroacoustic transducer (14c), and capable of converting the surface acoustic wave orbiting along the orbital band into a high frequency electric signal so as to detect the change in the propagation characteristic.

Claim Rejections - 35 USC § 103

2. Claims 4-7 are rejected under 103(a) as being unpatentable over Tsukahara et al.(US 6566787) in view of Tom (US 6029500).

With regard to claims 4-7 Tsukahara et al. teach that the piezoelectric, gas sensitive film provided at a predetermined position on the out surface can be prepared by all the currently known methods (Col. 11 lines 1-3).

With regard to claims 5 and 6 Tsukahara teach respectively that the thickness of the sensor head film is $1/500^{th}$ and $1/1000^{th}$ of the wavelength of the surface acoustic wave or less. Tsukahara teach that the wavelength (λ) of the surface acoustic wave to be between 100-800 μm

(Col. 3 line 53). Using λ =100 μm as the most stringent pole of the range, one five hundredth of 100 μm is 0.2 μm (200nm). One thousandth of 100μm is 0.1 μm (100nm).

Tsukahara et al. do not teach the film to have any particular thickness and does not teach that the film consists of palladium.

Tom teaches a piezoelectric quartz crystal hydrogen surface acoustic wave device sensor having a thin film of the thickness of 100nm coating thereon of a hydrogen-interactive metal such as palladium (Abstract and Fig.1).

Therefore, with regard to claim 5 and 6, Tom teach a thickness of the thin film that is $1/500^{th}$ and $1/1000^{th}$ of the wavelength of the surface acoustic wave since 100 nm in film thickness is equal to or less than $\lambda/500$ = 200nm and $\lambda/1000$ = 100nm.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose a Pd composition and such a thickness for the thin film, since Tom teaches that such a composed sensor "relates to a high sensitivity, high selectivity hydrogen gas sensor that is usefully employed in environments including those that have posed difficulties previously such as those containing other oxidizing species as well as in inert gases"(Col. 1 lines 48-53).

3. Claims 8 and 9 are rejected under 103(a) as being unpatentable over Tsukahara et al.(US 6566787) in view of Bartley et al. (US 6060692).

Tsukahara et al. do not teach a temperature sensor or resistive heating element on their SAW sphere transducer.

Bartley et al. teach a low power compact resistive heater (18) and sensor (Not shown but referenced in Col. 5 line 4) for piezoelectric devices (Figure 3).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to choose to add the sensor and resistance detection pattern of Tom to the spherical SAW device of Tsukahara for the expected benefit that the Tom device does not require special processing and maintains its inherent performance and frequency stability therefore not having a size or cost penalty (Col. 2 lines 5-11).

Response to Arguments

Applicant's arguments with respect to claims 1-9 and new claims 20-27 have been considered but are moot in view of the new ground(s) of rejection.

Regarding those arguments made in light of the Tsukahara et al. (6566787) patent, the applicant's argument that the '787 patent fails to disclose a gas sensitive film, configured to react with a specific gas molecule so as to develop a change in a propagation characteristic of the surface acoustic wave is not convincing as it is respectfully maintained as can be seen above that the film of Tsukahara is capable of reacting with a gas molecule as it is taught to do so in Col. 10 lines 54-59. Furthermore, applicant's argument that the '787 patent fails to disclose that the: *interdigital transducer converts the surface acoustic wave orbiting along the orbital band into a high frequency electric signal so as to detect the change in the propagation characteristic"* is not convincing as this recitation includes only an intended use of the structural components taught above by Tsukahara, and that Tsukahara's device is capable of performing this function. Applicant is encouraged to file method claims in a continuing application should they desire a patent for process steps such as those that are being claimed herein.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sally A. Sakelaris whose telephone number is 5712726297. The examiner can normally be reached on Monday-Friday 8-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 5712721267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SS /Jill Warden/
Supervisory Patent Examiner, Art Unit 1797

12/22/2009